AMENDMENTS TO THE SPECIFICATION:

Please replace the Title with the following Title:

~~SYSTEM AND METHOD FOR~~ A METHOD FOR CHARGING A PHOTORECEPTOR TO EXTENDING~~ING~~ THE LIFE OF A CHARGE RECEPTOR IN A XEROGRAPHIC PRINTER

Please replace paragraph [0003] with the following paragraph [0003]:

Charging involves contact charging of a photoreceptor by a bias charge roll (BCR). Its main advantage is its low footprint. Thus it is particularly suited for charging small diameter ~~OPC~~ organic photoconductive drums used in low and mid-volume B/W and color machines. Conventional BCR charging is based on a DC-offset AC excitation waveform. As a result a stable V-hi controlled by the DC bias is achieved when Vpp, the AC peak to peak voltage, is greater than a threshold voltage, V-th. ~~PQ~~ Print quality considerations such as background disappearance and halftone uniformity require Vpp and I_{AC} somewhat greater than the threshold values. Moreover, the trend toward increasing process speed in ~~OPC~~ organic photoconductive drum based machines particularly in tandem color applications leads to even higher AC current requirements.

Please replace paragraph [0004] with the following paragraph [0004]:

As is well established, the main drawback of conventional AC BCR charging is the significant limitation it imposes on ~~PR~~ photoreceptor life because degradative AC corona species are generated in close proximity to the ~~PR~~ photoreceptor surface. Significant work has been done to extend ~~PR~~ photoreceptor life such as the development of hard ~~PR~~ photoreceptor overcoats and corona resistant ~~CTL~~ charge transport layer materials (e.g. PTFE filled ~~CTLs~~ charge transport layers) as well as a variety of excitation waveforms such as DC, clipped AC or pulsed bias waveforms, each with varying degrees of success. DC BCR charging is a very effective means of improving wear life, but BCR sensitivity to contamination by toner and ~~PR~~ photoreceptor degradation products generally precludes its practical use. Pulsed bias and clipped AC excitation waveforms have been shown to greatly improve ~~PR~~ photoreceptor wear life but a stable V-hi cannot be attained with the latter. Instead V-hi increases monotonically as V-pp and I_{AC} increases. Thus practical implementation would require complex controls to achieve V-hi stability especially across environmental conditions, and may be difficult to achieve.

Please replace paragraph [0007] with the following paragraph [0007]:

Applicants have found that AC current is a key contributor to ~~PR~~ photoreceptor wear. Our approach to improving ~~PR~~ photoreceptor life has been to decrease AC current, not by reducing Vpp, but by reducing the AC duty cycle ("on time"). We propose the use of a "burst modulated" waveform for BCR charging, i.e. a DC offset AC waveform, in which an AC waveform of frequency F1 is gated on and off at a second frequency F2, the burst frequency. Note that only the AC part of the waveform is gated off. The DC

bias is maintained at all times. As a result a stable V-hi (independent of Vpp and I_{AC}) and the ability to set V-hi via the DC bias is achieved. The effect of decreasing duty cycle on ~~PQ~~ print quality and the corresponding charging characteristics have been studied and we have found that reasonable selection of the AC frequency and the gating frequency allows one to improve ~~PR~~ photoreceptor wear while maintaining good ~~PQ~~ print quality characteristics such as good halftone uniformity and acceptably low background.

Please replace paragraph [0019] with the following paragraph [0019]:

Two methods were used to vary the AC duty cycle and characterize burst modulated BCR charging. Method 1 fixes the burst rate F2 and varies the carrier frequency F1. Conversely Method 2 fixes the carrier frequency and varies the burst rate. Electrical results from Method 1 are illustrated in Figure 3. The open symbols in Figures 3A and 3B show the burst modulation charging results when the burst frequency F2 is fixed at 1.6 kHz and the carrier frequency F1 is varied from 2.0 – 4.8 kHz. At high duty cycle (e.g., F1 = 2.0 kHz) the charging behavior approaches that of conventional AC charging. As the carrier frequency increases and duty cycle decreases the charging behavior becomes increasingly non-ideal. At high carrier frequency, e.g. at 4.8 kHz, the charge relaxation time of the BCR limits charging efficiency and a stable V-hi becomes difficult to achieve as indicated in Figures 3A and 3B. Moreover, ~~PQ~~ print quality becomes very poor; high background results from the inability to charge to V-hi. The use of too high a carrier frequency to achieve low AC duty cycle must be avoided for these reasons. A practical carrier frequency upper limit for the ~~Tokai 2bb~~ BCR is about 2.4 - 3.2 kHz.

Please replace paragraph [0020]) with the following paragraph [0020]:

Figure 3 shows the charging results for varying the AC duty cycle by Method 2. Shown for reference in the filled circles in Figures 4A and 4B, respectively, are plots of V-hi against V-pp and I_{AC} for conventional AC BCR charging. The open symbols in Figures 4A and 4B show the results for burst modulated charging when the carrier frequency F1 is fixed at 1.6 kHz and the burst frequency F2 is decreased from 1.3 to 1.0 kHz (duty cycle decreased from 80% to 63%). Again at high duty cycle the charging characteristics of the burst modulation approach that of the conventional sine BCR charging. However, at a carrier frequency F1 = 1.6 kHz, the BCR is not relaxation time limited, so increasing the burst frequency has no effect on the V-hi – Vpp charging curve and in fact a beneficial effect on the V-hi – IAC charging curve is observed insofar as V-th is reduced. ~~The reason for this is not as yet clear.~~

Please replace paragraph [0021] with the following paragraph [0021]:

Figure 5 shows the wear results for conventional and burst modulated BCR charging obtained from print runs in a Docucolor 12 machine produced by Xerox~~DC12 machine~~. Common conditions for both tests are as follows. A ~~Tokai 2 bb~~ BCR was mounted with a ca. 900 gram normal force in a BCR holder retrofitted into a ~~DC12~~ the machine in the area normally occupied by the wire scorotron. Standard color toner and developer were used. The normal cleaning blade is mounted with the standard interference (1.1 mm) and blade set angle (22 degrees). The same drum photoreceptor was used in both tests. All tests were conducted in lab ambient, i.e., 68-70 °F and 30-50% RH.

The waveform parameters used in conventional AC sine BCR charging wear test are F = 1.6 kHz, Vdc = – 570 V and Vpp = 2.0 kV. This results in an AC current of 3.5 mA. The waveform for the corresponding burst modulated BCR charging wear test was F1 = 1.6 kHz (carrier frequency), F2 = 1.2 kHz (burst rate) and Vpp = 2.0 kV. This results in an I_{AC} = 3.0 mA. New BCRs were used for each test. Wear tests were conducted at constant Vpp to study the effect of decreased AC current and duty cycle. The wear data are plotted in Figure 5. The initial part of the curve (dashed line) shows wear data obtained during the burst modulated BCR charging. The second part of the curve exhibiting higher slope is the wear data obtained by conventional AC sine BCR charging. Wear rates of 51 nm/kprint and 63 nm/kprint are calculated for burst modulated and normal sine BCR charging, respectively, or a wear rate improvement of 23% with the burst modulated waveform. It is reasonably expected that decreasing the duty cycle from the 75% value in the above wear tests to 50% should improve the wear rate even further. Such an anticipated wear improvement would not come at the expense of ~~PQ~~ print quality since as shown below halftone uniformity and background are acceptable at 50% duty cycle. In terms of BCR contamination, no significant differences in the levels of contamination were observed between BCRs used in the burst modulated and conventional AC wear tests above after 30-45 kiloprints. This is not surprising as the continuous application of AC even at low duty cycle should be enough to remove charged contamination from the surface.

Please replace paragraph [0022] with the following paragraph [0022]:

~~PQ~~ Print quality was screened as a function of AC duty cycle and in virtually all cases no degradation relative to conventional AC BCR charging was

observed in ~~PQ~~ print quality attributes such as halftone uniformity, background and line density. The table in Figure 5 summarizes the results. Common test conditions include Vdc = -570 V, Vpp = 2.0 kV (constant voltage); the ~~PR~~ photoreceptor was an experimental PTFE filled ~~OPC~~organic photoconductive. Given a constant burst frequency of 1.6 kHz, variation in carrier frequency from 2.0 to 3.2 kHz (80% and 50% duty cycles, respectively) led to ~~PQ~~ print quality that was equivalent to the control, i.e., conventional AC BCR charging. However, when the carrier frequency was increased to 4.8 kHz (33% duty cycle), ~~PQ~~ print quality was characterized by severe background because the relaxation time limitations of this BCR prohibit attainment of V-hi. ~~PQ~~ Print quality was also generally good with a fixed 1.6 kHz carrier frequency and burst frequency varying from 1.3 to 1.0 kHz (80% and 63% duty cycles, respectively). At 1.6 kHz charging is not limited by BCR relaxation time limitations and burst frequencies lower than 1 kHz are probably useful. The lower limit of burst frequency would be dictated by the onset of banding in the prints. Optimization of carrier and burst frequencies to balance ~~PQ~~ print quality and wear was not done, however, it is clear that the optimized values of the latter should depend on process speed and the electrical properties of the BCR such as relaxation time.

Please replace the paragraph [0023] with the following paragraph [0023]:

The use of low AC duty cycles is also expected to increase the process speed limit of BCR charging. ~~We have routinely done BCR charging with excellent PQ at 48 ppm in the DC12 even in C-zone.~~ Burst modulation charging may extend the process speed limit even higher, perhaps as high as 60 ppm particularly if low duty cycles and conductive BCRs are used.

Please replace the paragraph [0025] with the following paragraph [0025]:

In recapitulation, there has been provided a charging system wherein unlike clipped or pulsed bias BCR waveforms, burst modulation BCR charging has the desired electrical characteristics of conventional BCR charging, namely, a stable V-hi (independent of Vpp and IAC) and the ability to set V-hi via the DC offset bias. The main advantage of burst modulation BCR charging is that without adversely affecting ~~PQ PR~~ print quality photoreceptor wear is decreased by reducing the AC duty cycle and AC current. Significant wear reductions should be achievable with even lower duty cycle waveforms than tested to date. The technique is fairly insensitive to contamination. Finally burst modulated BCR charging offers the possibility of extending BCR charging to even higher process ~~speeds~~speeds.